

NEW DEVELOPMENTS IN THE EXTRACTION OF NATURAL GAS

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INTRODUCTION

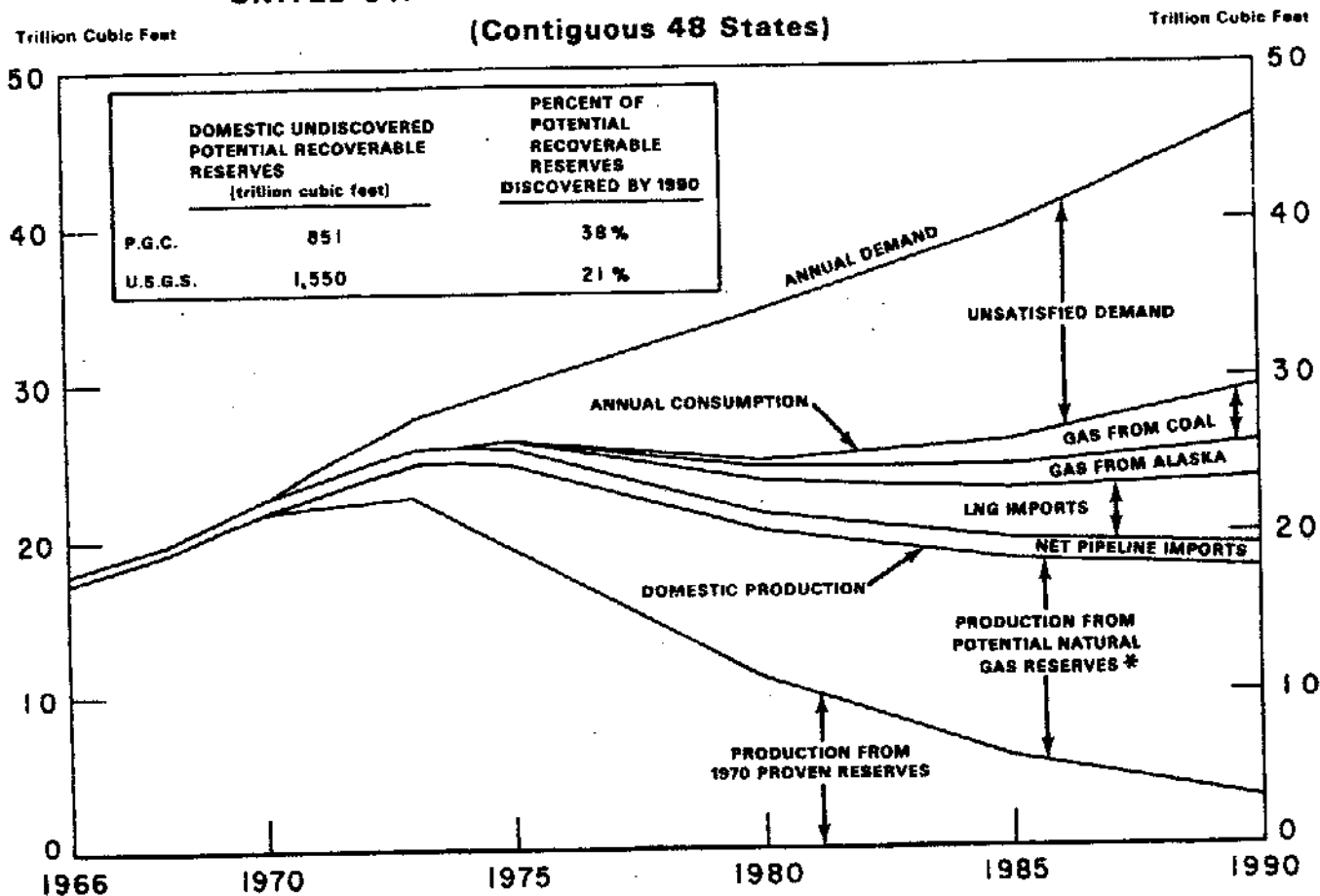
Opinion No. 622-A issued by the Federal Power Commission on October 5, 1972, states, quote: "The supply of available, deliverable natural gas in the United States is dangerously short. New supplemental supplies of gas are badly needed" unquote (Fig. 1). During the next few minutes I would like to discuss how the natural gas industry is seeking these new supplemental supplies of gas. Many of my remarks will concern the efforts being undertaken by Columbia Gas System, with which I am most familiar, but other companies in the industry are taking similar steps. Columbia's objective continues to be to develop a wide diversity of supply of gas and to maintain a balance between these sources.

DOMESTIC EXPLORATION AND DEVELOPMENT

Off-shore Texas and Louisiana

Since 1954 the Federal Government has offered for sale off-shore Texas and Louisiana 9.2 million acres of land to a water depth of 600 feet. For off-shore Louisiana some 59% of the available acreage has been offered and approximately 10% of the available Texas off-shore acreage has been offered. (Fig. 2) The 1968 sale off-shore Texas representing 5% of the Texas submerged Federal lands resulted in no commercial gas production. This lack of reserves casts a serious question on the entrapment of hydrocarbons along the entire Texas coast with the exception of the eastern area that borders Louisiana.

UNITED STATES GAS SUPPLY-DEMAND BALANCE ⁽¹⁾ (Contiguous 48 States)



* U.S. NATURAL GAS RESERVE ADDITIONS (1871-1890) TOTAL 325 TRILLION CUBIC FEET.

(1) SOURCE - FPC STAFF REPORT #2 ON GAS SUPPLY AND DEMAND, ISSUED FEBRUARY 1972.

FIGURE 1.

GULF OF MEXICO FEDERAL OUTER CONTINENTAL SHELF AREA TO 600'

<u>State</u>	<u>Total* Acreage Available</u>	<u>Total* Acreage Offered for Sale</u>	<u>Total* Acreage Leased</u>
Louisiana	14.0	8.2	4.7
Texas	10.0	1.0	1.0
Total	24.0	9.2	5.7

*Millions of Acres

FIGURE 2.

There is a need to find and develop between 50-55 trillion cubic feet of southwest gas reserves through 1980 to keep the interstate pipe line companies at the 1971 level of capacity. Therefore, the remaining 5.8 million acres off-shore Louisiana plus the 4 million acres of geographic favorable areas off-shore Texas must be explored and developed within a 5 to 6-year period. This will require the leasing of over 1.6 million acres per year commencing with 1972. The Interior Department has scheduled or given notice of its intention to schedule:

1. General sale off-shore Louisiana 78 tracts,

366,000 acres (delayed from December, 1971) held September 1972. (Fig. 3).

2. General sale off-shore Louisiana 135 tracts, 618,000 acres, tentatively set for December 1972, subject to outcome of hearings held August 1972. (Fig. 3)
3. General sale off-shore Texas, 633,000 acres, tentatively set for Spring of 1973. Hearings not yet scheduled. (Fig. 3)

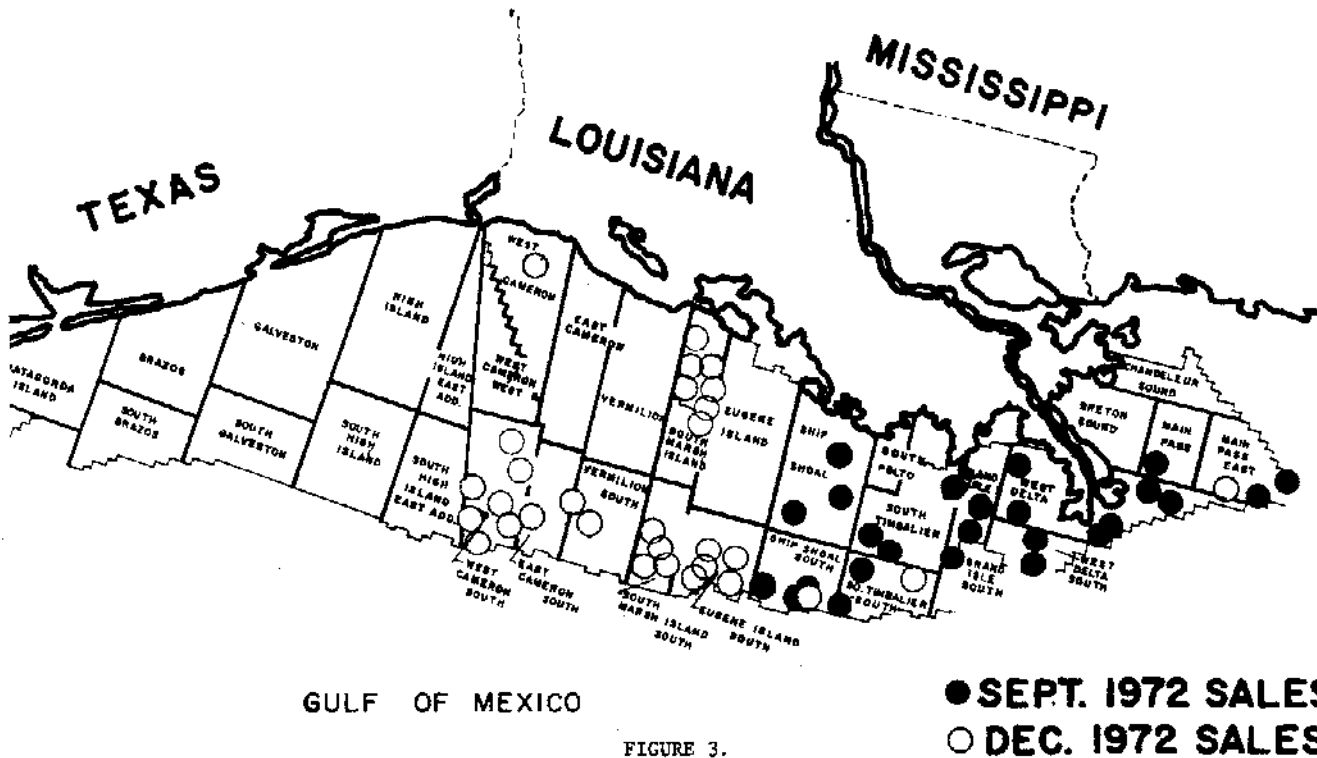


FIGURE 3.

Off-Shore East Coast

Columbia and the British Petroleum Company, Ltd., have reached an agreement which provides for Columbia's participation in an exploration program on approximately 12.7 million acres off Canada's east coast. Columbia will earn a significant working interest and a 100% right to all of the gas produced from this acreage. Seismic work on this acreage was conducted during the summer of 1972. Drilling is expected to begin in 1974 depending on the availability of drilling equipment.

Since 1968, Columbia has participated in a joint program of geophysical exploration in the Atlantic off-shore area. The surveys conducted ranged over an area from Cape Hatteras to off-shore Nova Scotia. This area represents approximately twice the area encompassed by the Gulf of Mexico Continental Shelf. Approximately 35,000 miles of survey have been run. Columbia has employed a firm to provide exclusive interpretation of all geological data which will be used as the basis for our evaluation of the gas potential of the Atlantic off-shore shelf. It is anticipated that Columbia would participate in any Federal East Coast lease sales when they are held. Currently no lease sales are scheduled. Governor Rockefeller vetoed a New York State bill precluding off-shore drilling, but similar state legislation is likely to come up again.

Efforts to acquire additional gas reserves through the exploration of deeper horizons in the Appalachian Basin have been expanded by Columbia. A deep test-well in southern West Virginia currently is drilling at 18,000 feet. Agreement has been reached on a major deep exploration program by Columbia and the Humble Oil and Refining Company on several hundred thousand acres held by Columbia in West Virginia. Columbia will retain the gas purchase rights under the program. Seismic activity is now under way to determine the requirements of the initial exploratory wells. Drilling activity has been accelerated in southern New York where producers are developing reserves in deeper horizons.

NON-HISTORIC SOURCES OF GAS

Synthetic Gas

There are currently, in various stages of planning, over 25 reforming plants of varying size up to a capacity of 500 million cubic feet per day contemplated for installation in the United States.

Columbia's Green Spring, Ohio reforming plant will provide 250 million cubic feet per day and has been planned to be operating by mid-1973. The mid-1973 on-stream date is now in doubt because of serious delays in obtaining regulatory authorization. The project has been going forward in spite of the lack of regulatory approval and is now 40% complete. The decision to proceed with Green Springs at great financial risk to Columbia was made in an attempt to have the synthetic gas available for the 1973-74 winter. To have awaited regulatory approval before proceeding would have had a serious impact on our ability to maintain present delivery levels for the winters of 1973-74 and 74-75. Columbia's financial exposure in the project is now in excess of \$23 million. Figure 4 gives a few cost figures on this project. Dome Petroleum, our feedstock supplier, has not yet received final approval from the Canadian National Energy Board to export the necessary feedstock volumes from Canada. The delay in regulatory approval is reported to be a jurisdictional dispute between the Federal and Provincial governments that goes beyond the Dome applications and involves the question as to who has the authority to set the conditions of the permit allowing exports of natural gas or liquid feedstocks to the U.S.

The second reforming project that we are currently working on is the purchase of 100 million cubic feet/day of synthetic pipeline quality gas from the tailgate of a clean fuels preparation plant to be constructed, owned and operated by the Crown Central Petroleum Company. (Fig. 5) The plant will be located in the Baltimore Harbor area. Crown Central will import approximately 100,000 barrels of crude oil a day which will be refined

GREEN SPRING'S REFORMING PLANT

- Capital Cost — \$38 Million
- Cost of Feedstock — 84.5 Cents per Million BTU
- First Year Cost of Gas — \$1.13/MCF
- Impact on System Gas Cost — 6 Cents/MCF

FIGURE 4.

CROWN CENTRAL REFORMED GAS PROJECT

- 100 MMCF/D of SPQ gas purchased by Columbia
- Feedstock: 100,000 BBLs/D imported crude oil
- Clean fuels plant output includes
 - Low sulphur fuel oil
 - Turbine fuel
 - Naphtha converted into SPQ gas
- Plant location: Baltimore Harbor area
- Special provisions under Oil Import Administration required

FIGURE 5.

into low sulfur fuel oil, turbine fuel, and naphtha, which in turn will be converted into SPQ gas. The planned start-up date for this plant is mid-1974 if the necessary governmental approvals are obtained. Special provisions under the Oil Import Administration quotas will be required to import foreign crude for processing into gaseous fuels and finished liquids.

Columbia has also entered into agreements with the Apco Oil Corporation to purchase 125 MMcf/d of SPQ gas which they will produce from naphtha (Fig. 6). The New England Petroleum Company will provide approximately 28,000 barrels of naphtha per day from its Bahama Island refinery for the Apco owned and operated reforming plant. The reforming plant will be located in eastern Pennsylvania.

The Department of the Interior presently allows naphtha to be imported primarily for petrochemical usage. Like the Crown Central project, the Federal Government's

position on importation procedures is of critical importance to the success of the Columbia-Apco project. Columbia has requested authorization from the Department of the Interior and the Office of Emergency Preparedness to import the required quantities of naphtha for the Apco reforming plant.

Liquefied Natural Gas (LNG)

Time-wise, the importation of LNG should be the next non-historic source to make a major contribution to the United States gas supply. The current state of worldwide LNG activity is such that it cannot be classified as new. LNG has been transported on a base-load basis from Algeria to Great Britain and France since 1964 and 1965 respectively; Alaska to Japan since 1969; and with initial deliveries from Libya to Spain and Italy in 1971.

On October 5, 1972, the Federal Power Commission affirmed its June 28th authorization of large volume im-

APCO REFORMED GAS PROJECT

- 125 MMCF/D of SPQ gas purchased by Columbia
- Feedstock: 28,000 BBLs/D imported Naphtha
- Reforming plant location: Eastern Pennsylvania
- Special provisions under importation procedures required

FIGURE 6.

port of LNG into the United States from Algeria, with certain modifications. El Paso Algeria Corporation, a subsidiary of El Paso Natural Gas Company, will transport the gas from Algeria in nine cryogenic tankers. El Paso will sell the gas to Columbia LNG Corporation, Consolidated System LNG Company, and Southern Energy Company with title passing on the high seas. The purchasing pipelines may transport and sell the regasified LNG only under separate rate schedules which reflect recovery of all LNG costs and a fair allocation of costs of service of transportation and storage.

Arctic

Oil and Gas from Prudhoe Bay. In the Prudhoe Bay area of Alaska, large volumes of untapped, proved gas reserves are contained with the established oil reserves. It is currently estimated that these gas reserves contain over 26 trillion cubic feet. Since the Prudhoe Bay gas reserves are found in association with oil deposits, they cannot be produced until the initiation of oil production. The injunction against the Alyeska Pipeline Service Company, which was to build an oil line south from Prudhoe Bay, has been lifted by the Federal District Court and the question is now before the Court of Appeals in the District of Columbia. Argument was held on October 6, 1972, before a full nine-man court. On September 12, eight oil companies sued in Alaska State Courts to invalidate the new state right-of-way leasing act and the new amendment placing state severance taxes on oil production.

Canadian Arctic Gas. Agreements have been concluded by Columbia with a number of firms, including Panarctic, Dome Petroleum, Forest Oil, British Petroleum, and Deminex, for the exploration and development of new gas reserves.

Exploratory efforts under the Panarctic agreement have resulted in significant gas discoveries at Kristoffer Bay on Ellef Ringnes Island and on Melville Island at

Drake Point. Confirmation of an earlier gas discovery on King Christian Island was also completed by Panarctic. Panarctic is made up of 19 Canadian mining and petroleum companies and the Canadian Federal Government, with the latter having a 45% ownership position. Columbia, Northern Natural, Texas Eastern and Tenneco will, as a group, spend up to \$75 million over approximately five years on exploration activities, with Panarctic.

The Alyeska oil pipeline would run from Prudhoe Bay to Valdez, Alaska, roughly paralleling the Alaska-Canada border.

Coal Gasification

For many reasons, the nonconventional source with greatest long-range potential to U.S. gas supply is coal gasification. The reserves of recoverable coal in the U.S. are enormous; they are located in close proximity to existing major gas transportation and distribution systems; and more importantly, this potential source of gas is not susceptible to actions or controls of foreign governments.

The gasification of coal has been used for many decades to produce a low calorific value, synthetic gas. Current U.S. coal gasification development programs are targeted for producing pipeline quality gas with a BTU content that will be interchangeable with current natural gas supplies.

A joint industry-government program is currently evaluating coal gasification processes for producing pipeline quality gas. The need for this program was stressed by President Nixon in his "Clean Energy Message" to Congress in June, 1971. The overall program was planned to be completed in four years. It called for a total commitment of \$120 million with one-third being provided by industry (Fig. 7). The first year funding in 1972 has been reduced by virtue of insufficient government appropriations to only about 80% of the proposed

INDUSTRY – GOVERNMENT COAL GASIFICATION RESEARCH PROGRAM

• Total Program Costs	\$300 Million
• First Phase (3 years)	\$ 90 Million
– Government	\$ 60 Million
– Industry	\$ 30 Million

FIGURE 7.

EARLIEST NEW SUPPLIES

- Reforming hydrocarbons into synthetic pipeline quality gas
- Deep drilling in Appalachia
- Discovery and development of reserves in the Gulf of Mexico
- Deep exploration of favorable sedimentary trends such as the Black Warrior and Anadarko Basins

FIGURE 8.

annual level.

Three established pilot plant evaluations are being conducted under this program. The Pilot plant located in Chicago, utilizing what is referred to as the Hygas process, was completed in 1971. It was constructed and is being operated under the direction of the Institute of Gas Technology.

It is estimated that supplies from coal gasification will not be a significant factor in U.S. total gas supply until the early 1980's. The outlook beyond 1980 for developing coal gasification as a major source of gas supply is bright. Current estimates are that in 1985, 5% of the total U.S. gas supply or nearly 1.5 trillion cubic feet per year can come from this source.

Conclusion

The natural gas industry is diligently seeking solutions to the gas supply problem. Columbia's objective continues to be to develop a wide diversity of supply and to maintain a balance between sources. As an energy user, taxpayer, and voter, you should voice your thoughts about the problems which delay new supplies of energy. Our Company feels the National Environmental Policy Act must be clarified; that a Department of Natural Resources should be established; and that the administrative processes of government must be streamlined to provide more timely responses to energy issues that come before it. Write to your senators and representatives and urge them to support the action program to develop new energy sources. We welcome the support of everyone genuinely concerned with the need for more clean energy.